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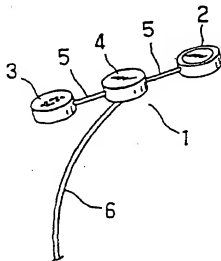
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**(54) TRANSMITTER/RECEIVER COMPRISING BONE-CONDUCTION SPEAKER**

(57) The object is to provide a handset for a telephone set or for a radio communication unit to enable its user to receive a communication while enjoying music through a headphone set and the like. The handset is small in size, light in weight and excellent in fittingness. Further, the handset enables its user to easily perceive a voice sound in communication even in a high-noise environment, and also enables the user to speak in a whisper without making the people around the user

uncomfortable. Still further, the handset is capable of serving as a personal ornament of the user. The handset is provided with a bone conduction speaker portion 2, a microphone portion 3 and a drive circuit storage portion 4, and is capable of being connected with the telephone set or the radio communication unit. The bone conduction speaker portion 2 is capable of being disposed adjacent to any desired area of the user's face when the microphone portion 3 is disposed adjacent to the user's mouth.

**FIG. 1**

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**Description****FIELD OF THE INVENTION**

[0001] The present invention relates to a handset (i.e., transmitter/receiver) provided with a bone conduction speaker, and more particularly to the handset which is downsized by using the bone conduction speaker so as to be connected with and used together with a PHS (personal handy-phone system), a cell phone or a radio communication unit.

**BACKGROUND OF THE INVENTION**

[0002] As for a conventional handset for a telephone set and the like, the handset is improved in its transmitter portion by using a close-talking microphone so as to be capable of being used even in a high-noise environment, but not improved in its receiver portion in which a conventional air-conduction speaker is used without any improvement so that it is difficult for the user to catch a voice sound in the high-noise environment. Due to the presence of such difficulty of catching the voice sound, the user of the conventional handset must close one of his/her ears with his/her hand in order to try to catch the voice sound when he/she receives a communication from his/her partner in communication. The spectacle of such user's behavior has been often witnessed.

[0003] In a unit such as a cell phone or a PHS, since a microphone and a speaker of the unit are disposed in a small-sized casing, the microphone in the transmitter side of the unit is separated from the user's mouth when the speaker in the receiver side of the unit is brought into close contact with the user's ear, which makes it impossible for the user to whisper in communication since such whisper is not sufficiently transmitted to his/her partner in a communication.

[0004] In order to compensate for such disadvantages, there is provided a conventional transmitter/receiver unit serving as an externally connected device which is adapted to the cell phone and the like. The conventional transmitter/receiver unit has its microphone separated from its speaker. In use, such conventional unit is mounted on the user's ear or inserted into an acoustic meatus of the user's ear. Due to this, the conventional unit is not used together with the headset and the like. Further, in view of a physical distance between the user's ear to his/her mouth, it is difficult to downsize the conventional transmitter/receiver unit. Further, in such downsizing, there are many restrictions on the configuration of the conventional transmitter/receiver unit. Still further, in the conventional transmitter/receiver unit, since its microphone is separated from its speaker, the conventional unit is poor in portability and in fitness. Further, in the conventional unit, it is difficult for its user to immediately answer a phone call.

[0005] As described above, the conventional transmitter/receiver unit serving as the externally connected

device connected with the cell phone and the like suffers from various disadvantages. Consequently, it is an object of the present invention to solve the above disadvantages by providing a handset, which is small in size, light in weight and excellent in fitness. Further, the handset of the present invention enables a user thereof to easily perceive any voice sound in communication even in a high-noise environment, and also enables the user to speak in a whisper without making the people around the user uncomfortable. Still further, it is possible for the user of the handset of the present invention to communicate with his/her partner in a communication while enjoying music and the like through a headset and the like. The handset of the present invention is capable of also serving as a personal ornament.

**SUMMARY OF THE INVENTION**

[0006] The present invention resides in a handset using a bone conduction speaker, the handset comprising: a bone conduction speaker portion; a microphone portion; and, a drive circuit storage portion, wherein the handset is capable of being connected with a telephone set or a radio communication unit, wherein the bone conduction speaker is so arranged as to be capable of abutting against an arbitrary area of a user's face when the microphone portion is disposed adjacent to the user's mouth.

[0007] A finger-mounted portion assuming a cap-like configuration or a finger ring-like configuration may be provided in the bone conduction speaker portion and/or the microphone portion. Further, the bone conduction speaker portion, the microphone portion and the drive circuit storage portion may be coated with a decorative exterior member.

**BRIEF DESCRIPTION OF THE DRAWING**

[0008] Fig. 1 is a perspective view of an embodiment of the present invention. Fig. 2 is a perspective view of another embodiment of the present invention. Fig. 3 is a perspective view of further another embodiment of the present invention. Fig. 4 is a perspective view of still further another embodiment of the present invention. Fig. 5 is a perspective view of another embodiment of the present invention. Fig. 6 is a perspective view of further another embodiment of the present invention.

**BEST MODE FOR CARRYING OUT THE INVENTION**

[0009] With reference to the accompanying drawings, embodiments of the present invention will be described. As shown in Fig. 1, a handset 1 of the present invention using a bone conduction speaker is constructed of: a bone conduction speaker portion 2 constructed of a bone conduction speaker; a microphone portion 3, which is usually constructed of a close-talking microphone; a speaker amplifier disposed therebetween; a

microphone amplifier; a drive circuit storage portion 4 including a battery (which may be eliminated when power is derived from a main body of the telephone set or of a radio communication unit) and the like; and, connecting portions 5 for mechanically supporting the above individual component portions, the connecting portions 5 being electrically connected with such component portions.

[0010] The bone conduction speaker portion 2 functions to transmit a voice sound as a bone-conduction sound, and is brought into close contact with the user's face in the vicinity of his/her ear when used. In most cases, the bone conduction speaker portion 2 is substantially symmetrically arranged with the microphone portion 3 with respect to the drive circuit storage portion 4.

[0011] A structural member (shell) of each of the bone conduction speaker portion 2 and the microphone portion 3 is made of resilient flexible materials having an affinity for the user's skin. For example, the flexible materials comprise annealed copper wires, rubber, urethane resins, polyvinyl chloride resins, silicone resins and the like.

[0012] In the drawings, 6 denotes a connecting cord for connecting the handset of the present invention with the cell phone, PHS or a main body of a radio communication unit.

[0013] In an embodiment shown in Fig. 2, in order to facilitate a mounting and supporting operation of the handset of the present invention on the user's face, a finger-mounted portion 7 assuming a cap-like configuration or a finger ring-like configuration is provided in the bone conduction speaker portion 2 and/or the microphone portion 3. In this case, the user has one or two of his/her fingers inserted into the finger-mounted portions 7, and then has the bone conduction speaker portion 2 brought into slight press contact with his/her forehead, temple, cheekbone, the middle of his/her forehead, or the like to catch a voice sound having been received in a condition in which the user has his/her mouth disposed adjacent to the microphone portion 3 to communicate with his/her partner in a communication.

[0014] When the microphone portion 3 is disposed inside the user's palm, it is possible for the user to cover his/her mouth with his/her hand while communicating with his/her partner, which makes it possible for the user to speak in a whisper much smaller in level than that the user uses in one-piece communication units such as a cell phone, a personal handy-phone system, a radio communication unit or the like.

[0015] An embodiment shown in Fig. 3 has the connecting portion 5 formed into a C-shaped configuration, which makes it possible for this embodiment to be mounted on the user's wrist in wearing. More specifically, the connecting portion 5 has a moderate resiliency, which makes it possible to resiliently separate the bone conduction speaker portion 2 from the microphone portion 3 when the embodiment is mounted on the user's wrist in an insertion manner. After completion of inser-

tion of the user's wrist into the embodiment, the connecting portion 5 resiliently returns to its substantially initial configuration so that the embodiment is brought into a slight press contact with the user's wrist.

[0016] Another embodiment shown in Fig. 4 enables the handset 1 to also have personal ornament properties. In this case, each of the above-mentioned components 2 to 4 is coated with each (shown in Figs. 4 and 5) of external members 8 or coated with an integral external member 9. Preferably, such external members 8, 9 are made of vibration-absorbing materials such as rubber, urethane resins, silicon resins and the like, or formed of such vibration-absorbing materials coated with hard materials such as plastics, metals and the like. Further, the external members 8, 9 are formed into decorative configuration provided with patterns and colors in appearance.

[0017] Incidentally, when the individual components 2 to 4 are separately formed, it is possible to gather these components 2 to 4 by withdrawing the connecting portions 5 into the drive circuit storage portion 4 during non-use of the handset 1 in order to save space (see Fig. 4 (B)) as a whole.

[0018] Further, by forming one or a plurality of the above components 2 to 4 into a clip-like configuration or by mounting a hook and the like on a rear surface of one or a plurality of the components 2 to 4, it is possible to mount the handset 1 as personal ornament on the user's clothes during non-use of the handset 1. In this case, it is possible for the user to immediately answer a phone call and also possible immediately call his/her partner in a communication to the phone.

#### INDUSTRIAL APPLICABILITY

[0019] The present invention having the above construction has the following effects:

- 1) Since the bone conduction speaker is used in place of an ordinary air-conduction speaker, there is no need the user to have the speaker portion of the handset brought into contact with his/her ear. Due to this, it is possible to freely design the configuration of the handset without considering a distance between the user's mouth and his/her ear;
- 2) The handset of the present invention enables its user to easily perceive any voice sound in communication even in a high-noise environment, and also enables the user to speak in a whisper without making the people around him/her uncomfortable, wherein such whisper is much smaller in sound level than that he/she uses in one-piece communication units such as a cell phone, a PHS and a radio communication unit;
- 3) In use, since the speaker portion of the handset is not necessarily disposed in the vicinity of the user's ear, it is possible for the user to communicate with his/her partner in a communication while en-

joying music through a headset and the like, for example.

4) It is possible to provide a personal ornament type headset, which is small in size, light in weight, versatile in configuration and excellent in ornamental properties. Consequently, the above-mentioned effects of the present invention are capable of further fueling the demand for the headset and also capable of satisfying the user's taste.

[0020] Since the present invention has the above effects, it is possible to further increase the number of the users of the cell phones and the like, which has a large economic effect on the communication industry.

#### Claims

1. A headset using a bone conduction speaker, the headset comprising: a bone conduction speaker portion; a microphone portion; and, a drive circuit storage portion, wherein the headset is capable of being connected with a telephone set or a radio communication unit, wherein said bone conduction speaker is so arranged as to be capable of abutting against an arbitrary area of a user's face when said microphone portion is disposed adjacent to the user's mouth.
2. The headset as set forth in claim 1, wherein said drive circuit storage portion is disposed between said bone conduction speaker portion and said microphone portion.
3. The headset as set forth in claim 1 or 2, wherein a structural member of each of said bone conduction speaker and said microphone portion is made of resilient flexible materials such as annealed copper wires, rubber, urethane resins, polyvinyl chloride resins, silicone resins and the like.
4. The headset as set forth in any one of claims 1 to 3, wherein a finger-mounted portion assuming a cap-like configuration or a finger ring-like configuration is provided in said bone conduction speaker portion and/or in said microphone portion.
5. The headset as set forth in any one of claims 1 to 4, wherein said bone conduction speaker portion, said microphone portion and said drive circuit storage portion are coated with a decorative exterior member.
6. The headset as set forth in any one of claims 1 to 5, wherein one or more of said bone conduction speaker portion, said microphone portion and said drive circuit storage portion is or are capable of engaging with the user's clothes.

FIG. 1

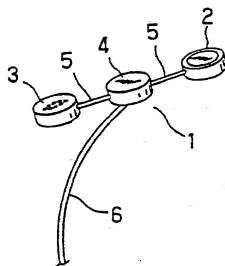


FIG. 2

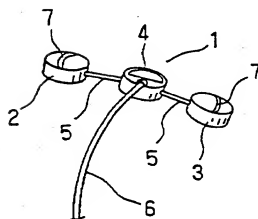


FIG. 3

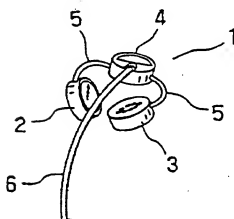


FIG. 4 (A)

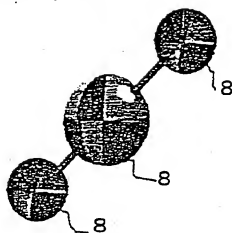


FIG. 4 (B)



FIG. 5

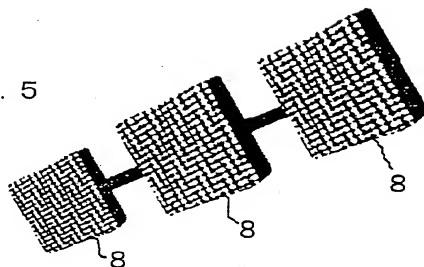


FIG. 6 (A)



FIG. 6 (B)

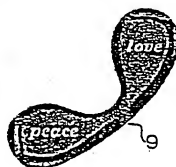


FIG. 6 (C)



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP99/07347

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. <sup>7</sup> H04R1/00, H04M1/03		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int. Cl. <sup>7</sup> H04R1/00-1/46, H04M1/02-1/23		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2000 Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1996-2000		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 004328/1979 (Laid-open No. 104868/1980) (IWATSU ELECTRIC CO., LTD.), 22 July, 1980 (22.07.80), page 4, line 17 to page 5, line 12; Fig. 3	1-2
Y	page 4, line 17 to page 5, line 12; Fig. 3 (Family: none)	3-6
Y	JP, 10-65785, A (Hoshiden Corporation), 06 March, 1998 (06.03.98), page 3, left column, lines 6 to 31; Figs. 1, 2	1-2
Y	page 3, right column, line 35 to page 4, left column, line 1; Fig. 4 (Family: none)	4
Y	JP, 59-209000, A (Shigeru TSUTSUMI), 27 November, 1984 (27.11.84), Full text; Figs. 1 to 2 (Family: none)	3
Y	Microfilm of the specification and drawings annexed to	5
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* "A" Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "Z" document member of the same patent family	
Date of the actual completion of the international search 27 January, 2000 (27.01.00)		Date of mailing of the international search report 08 February, 2000 (08.02.00)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP99/07347

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	the request of Japanese Utility Model Application No. 189879/1986 (Laid-open No. 95388/1988) (Ashida Onkyo K.K.), 20 June, 1986 (20.06.88), Full text; Figs. 1 to 10 (Family: none)	
Y	JP, 7-336786, A (Hiroshi HANADA), 22 December, 1995 (22.12.95), Full text; Figs. 1 to 4 (Family: none)	6

Form PCT/ISA/210 (continuation of second sheet) (July 1992)